

Teacher preparation in the wild west: The impact of fully online teacher preparation and uncertified teachers in Texas

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Abstract

This study addresses the burgeoning phenomenon of fully online alternative teacher certification programs (ACPs). In Texas where most teachers are prepared via ACPs, our research zeroes in on the proportion of teachers who are prepared fully online and the relative effectiveness of teacher preparation programs on student achievement and teacher retention. Using statewide longitudinal data from 2014-2023, our findings show that 1 in 4 of Texas students are being taught by teachers prepared fully online. Students taught by teachers prepared online exhibit comparable levels of achievement to those taught by uncertified teachers, underperforming compared to students taught by teachers from other preparation pathways. Moreover, these teachers exhibit a markedly higher turnover rate. This study contributes to the ongoing discourse on teacher preparation quality, offering insights for policymakers and stakeholders.

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Teacher preparation in the wild west: The impact of fully online teacher preparation and uncertified teachers in Texas

Teacher preparation programs (TPP) across the United States (U.S.) are expanding and diversifying (New America Foundation, 2023). Over the last decade, the proportion of teachers prepared through alternative certification programs (ACPs) has grown, though, as of 2020, the majority of teachers across the nation are still prepared in traditional university-based TPPs (Yin & Partelow, 2020). Increasingly, these traditional university based TPPs face competition from ACPs offered by a wide range of providers. These ACPs can include standalone TPPs, such as Relay Graduate School of Education (Relay Graduate School of Education, 2023), community-based approaches such as Grow Your Own Teacher models conducted in partnership with local school districts (Motamedi, 2017), or offerings from for-profit providers. At the same time that the TPP landscape is growing increasingly varied and fragmented, TPPs across the nation are facing declining enrollments, creating a complex policy landscape in which TPPs compete for a shrinking pool of teacher candidates (Knox, 2022)

The TPP landscape in Texas offers an extreme embodiment of these trends. Texas is the state with the largest teacher workforce, but faces ongoing teacher shortages in many areas of the state (Bland et al., 2023). The COVID-19 pandemic has exacerbated these shortages, and in March 2022 Governor Abbott convened a task force to develop policy solutions for these shortages. The task force made a wide range of recommendations, including strengthening the new teacher pipeline through investments in Grow Your Own programs and student teacher residencies (Teacher Vacancy Task Force, 2023). Many parts of the state, particularly rural and remote areas, are experimenting with a wide range of solutions, such as providing housing for teachers or offering four-day school weeks (Johnston, 2023; McNeel, 2022). Additionally, the state has developed the

Teacher Incentive Allotment, a pay for performance system designed to incentivize highly effective teachers to continue teaching (Texas Education Agency, 2023).

The Texas State Board of Educator Certification (SBEC) oversees teacher preparation and certification policy in the state. In 2001, the SBEC modified the requirements for teacher licensure programs and reduced the required number of field-based experience hours to 30, and 15 of which can be done online. The SBEC defines a field-based experience as, “Introductory experiences for a [teacher candidate] involving, at a minimum, reflective observation of Early Childhood-Grade 12 students, teachers, and faculty/staff members engaging in educational activities in a school setting” (Texas Education Code, 2020). In practice, this rule change allows for individuals to become certified to teach in Texas while only observing classrooms, in-person and online, for 30 hours, which is less than one full work week.

This minimal requirement for field-based experiences has allowed for the proliferation of TPPs that offer their coursework online, usually asynchronously, and offer only 30 hours of field-based experiences. We consider this approach – online coursework and the minimum requirement of field-based experiences – to be a unique subset of TPPs, which we define as fully online TPPs. In Texas, this approach to teacher preparation has been the subject of recent scrutiny and legal action (Donaldson et al., 2022). In 2022, one of the largest TPPs in the state, and one that is a fully online TPP, was placed on probationary status by the SBEC after a recommendation from the Texas Education Agency (Richman, 2023). As these types of TPPs face increasing public scrutiny, it is also vital to understand the impact of this model of teacher preparation on K12 student learning. Our study is the first examination of the effect of online TPPs on K12 student learning. Our research questions are:

1. Does achievement differ for students of recently certified teachers based on their preparation pathway to teaching?

2. Does achievement differ for students of teachers who completed a clinical student teaching experience compared to students of teachers who complete an internship in lieu of student teaching?
3. Does the likelihood of turnover differ for recently certified teachers based on their preparation pathway to teaching?

Literature Review

There is an extensive body of literature on the relationship between pathways to teaching and outcomes of interest, including student learning, the extent to which teachers remain in the profession, and teacher mobility between and within districts. In general, this research has focused on the extent to which measurable differences can be observed in these outcomes across pathways to teaching, particularly ACPs and traditional TPPs. Until this study, differences within the ACP sector, especially differences between programs delivered online versus those delivered face to face, were left unexplored.

Measuring TPP Quality

For the last decade there has been a growing policy push, both through federal programs such as the Race to the Top competition as well as accreditation bodies such as CAEP, to evaluate TPPs using the academic outcomes of K-12 students taught by program graduates (Council for the Accreditation of Educator Preparation, 2022; U.S. Department of Education, 2011). A growing body of literature investigates the use of value-added measures (VAM) of teacher effectiveness to quantify the effectiveness of TPPs. VAMs have been shown to be sensitive to the modeling choices made by researchers, including the inclusion of random effects, the use of school fixed effects, the decisions around clustering of standard errors, and the non-random assignment of teachers to schools (Goldhaber et al., 2013; Koedel et al., 2015)

Research comparing TPPs in Texas and Missouri has found only small differences in teacher quality, with estimates that are noisy or unreliable (Koedel et al., 2015; Mihaly et al., 2013; von Hippel et al., 2016), while research using the Tennessee Statewide Longitudinal Data system found significant variation between TPPs in both classroom practice and VAMs (Bardelli et al., 2023). Certain features of TPPs are linked with increased measures of teacher quality. In particular, elements of TPPs that more closely reflect the work of teaching, such as classroom observations, student teaching, and curriculum review, are linked with increased student outcomes (Boyd et al., 2009). Longer student teaching experiences are also linked with an increased sense of preparation to teach (Ronfeldt et al., 2014).

TPP Pathways and Teacher Retention

Teacher retention is a key outcome of interest when examining the impact of TPP types. Teachers prepared in traditional university based settings have been shown to be more likely to stay in the teaching profession when compared to teachers prepared via ACPs (Van Overschelde & Wiggins, 2020; Zhang & Zeller, 2016). A study using data from North Carolina found that traditionally prepared teachers are less likely to leave their school both within the school year and at the end of the school year, when compared with teachers prepared via ACPs (Redding & Henry, 2019). Similarly, a study using nationally representative data from the Schools and Staffing Survey found that teachers from ACPs were more likely to turnover than traditionally prepared teachers (Redding & Smith, 2016).

Variation within the ACP Sector

There is an extensive body of literature examining the differences between traditional four year undergraduate pathways to teaching and alternative routes to teaching, including differences in timing (Henry, Bastian, et al., 2014a), philosophical orientations regarding the balance between theoretical knowledge and on-the-job training (Darling-Hammond, 2010; Huling et al., 2001; Walsh,

2001), and student learning outcomes (Boyd et al., 2006; Goldhaber et al., 2013; Henry, Bastian, et al., 2014a; Kane et al., 2008).

Recently, research on the impact of TPPs on student outcomes has evolved away from a traditional/ACP dichotomy to explore variation in program design and impacts within the ACP sector. Increasingly, universities are also offering fast-track programs that mirror standalone ACPs in their structure, design, and time to completion (Gatlin, 2009). Using a typology based around certification pathways, organizations, and market incentives, Lincove and colleagues (2015) identified eight distinct categories of TPPs in Texas, including ACPs at public universities, ACPs at private universities, independent for-profits, and independent non-profits. The effects of these different program types varied considerably, with independent nonprofits showing positive effects on student learning in math. Similarly, a study using data from North Carolina identified 11 “portals”, or ways that individuals could enter teaching in the state. When compared with traditionally prepared in-state teachers from public universities, researchers found that teachers from ACPs were less effective in high school and teachers from Teach for America, a distinct ACP-based pathway to teaching, were more effective in STEM subjects and in secondary teaching placements (Henry, Purtell, et al., 2014a).

Fully Online ACPs

ACPs that are offered entirely, or almost entirely, online are one of the fastest growing types of ACPs in Texas. These programs are usually offered by for-profit entities, not associated with a college or university, and offer a fully online option (Yin & Partelow, 2020). There is limited empirical research on the effects of fully online TPPs on student learning and teacher retention. Recently, some of these programs have come under scrutiny in Texas due to concerns about program quality and structure (Donaldson et al., 2022). The largest TPP in Texas is a fully online

provider that may lose state accreditation due to its failures to comply with a state-mandated improvement plan (Richman, 2023).

Internship versus Clinical Student Teaching

In Texas, teachers have the unique opportunity to enter the profession through a one-year internship, bypassing traditional student teaching. This pathway allows them to immediately serve as teachers of record, earning a full-time salary while completing their certification requirements. To be issued an internship certificate, candidates must complete the 30 hours of classroom observation, pass the TExES exam, and be hired by a school district. While a majority of candidates in ACPs opt for the internship option, candidates can complete a clinical teaching experience. In addition to examining effects of fully online TPPs, we also explore the outcomes of teachers who choose this internship route within each preparation pathway, examining how their experiences and effectiveness in the classroom compare to those who follow the conventional path of student teaching.

Method

Data for this analysis were sourced from the University of Houston Education Research Center (UH-ERC), which houses the Texas Statewide Longitudinal Data System. The UH-ERC connects individuals attending Texas public K-12 schools longitudinally from K-12 schools to postsecondary certificate and degree programs to the workforce by interlinking data collected by TEA, the Texas Higher Education Coordinating Board (THECB), and the Texas Workforce Commission (TWC). Among these, TEA contributes detailed administrative records on public students and teacher certifications, as managed by the State Board of Educator Certification (SBEC). Our study centers on N=2,015,641 students who were taught by reading and math teachers in their five years of professional teaching in the 2014-2023 school years.

Outcomes

We examined two sets of outcomes. First, we evaluate achievement outcomes of students on the State of Texas Assessments of Academic Readiness (STAAR). STAAR scores are initially reported as IRT (Item Response Theory) Scale Scores. Students are tested every year in grades 3-8 in math and reading. We focus on math achievement for students in grades 4-7 given the availability of a lagged achievement measure from the previous year (3rd grade) and students enrolled in middle school Algebra I complete the Algebra I end-of-course exam instead of the standard 8th grade math assessment. We examine reading achievement for students in grades 4-8. No testing data is available for the 2019-20 school year due to school closures as a result of the COVID-19 pandemic. Additionally, we exclude testing data from the 2020-21 school year, as many students were allowed to opt-out of assessments based on their approval for online learning. In our analysis focused on student achievement outcomes, this restricts the final sample to students and teachers from the 2013-14 through 2018-19 and the 2021-22 through 2022-23 school years.

Second, we examine the likelihood of turnover for teachers after each full year in the classroom. For this study, we defined turnover as the initial year a teacher changed school districts or left Texas public schools. We focus on teachers of 4th-8th grade students in our sample, but we include teacher observations in the 2019-20 and 2020-21 school years. We observe whether teachers change districts in all years of the sample.

Preparation Pathway

We categorized ACPs into seven distinct groups: fully online programs, university alternative programs, programs operated by local education agencies (LEAs) or regional service centers, other postbaccalaureate alternative programs, and out-of-state programs. We classify teachers with no certification as uncertified. Traditional undergraduate university programs serve as the reference group against which these alternative pathways are compared. Our classification criteria for each pathway is described in the appendix. Note that candidates opting for the clinical experience in

programs that we would otherwise consider fully online are categorized into the other postbaccalaureate alternative programs in our baseline results, although we later explore whether these candidates differ in their impacts on achievement by recategorizing them into a fully online, clinical category. Descriptive statistics for teachers and their respective students are presented in Table 1.

A few observable characteristics among teachers and students appear across pathways. The advantage of opting for the paid internship option is apparent across ACPs, with noticeably few candidates in university alternative programs completing this option. Black teachers and students are overrepresented in online and other postbaccalaureate programs as well as the uncertified category. Male teachers are overrepresented in online and other postbaccalaureate options. Student characteristics are fairly balanced across categories. One characteristic of note is that students of online and other postbaccalaureate programs have lower prior achievement compared to students across other pathways.

Covariates

We account for a range of covariates at the teacher, student, classroom, and school-levels. For teachers, covariates include demographic information race/ethnicity and sex, the possession of an advanced degree (e.g., master's) total years of teaching experience, a squared term for years of experience to capture nonlinear effects of years of experience, whether they were teaching out of content area or grade level certification, and natural log of their total pay. At the student level, we include prior achievement in reading and math, demographic characteristics (sex, race/ethnicity), special education status, English learner status (current or reclassified), and economically disadvantaged status. We also aggregate these characteristics to represent classmate characteristics.

Analysis

We employ a value-added empirical strategy developed in the robust literature on measuring teacher effectiveness using longitudinal data (Bacher-Hicks & Koedel, 2023; Koedel & Rockoff, 2015). The model is represented as follows:

$$Y_{ijkt} = \beta_0 + \beta_1 T_{ijkt} + X'_{ijkt} + \theta_k + \epsilon_{ijkt}$$

Here, Y represents the test score for student i , taught by teacher j in school k in year t . The key variables of interest are represented by T , a vector of dummy variables representing the type of TPP completed by the teacher. Our analytical approach follows the tradition of using TPP or TPP type fixed effects to examine differences in educational outcomes, aligning with the methodology of previous research in the field (Boyd et al., 2006; Henry, Bastian, et al., 2014b; Henry, Purtell, et al., 2014b; Koedel et al., 2015; Sass, 2011). Our standardization of the testing outcomes facilitates the interpretation of our coefficients as effect sizes. X is a vector of covariates, and θ is a school-by-year fixed effect. The error is clustered at the teacher-level.

Intern versus Standard Credential

A majority of TPPs offer both a clinical and paid-internship option to satisfy state requirements for professional licensure. Teachers who opt for the internship are issued a nonrenewable two-year teaching credential. After completing two years of full-time teaching with the required number of classroom observations from TPP supervisors, the teachers are issued a standard credential. In model 1, we categorize teachers who attended a TPP with a fully online pathway but opted for the clinical experience into the other postbaccalaureate TPP. To examine differences between teachers attending the same TPP but opt for the clinical experience, we include these teachers into the online category and then bifurcate all pathways into intern vs. clinical experiences.

To examine differential TPP impacts on teacher turnover, we employ a linear probability model with aggregated characteristics from Model 1 to the teacher-by-year level. As such, the beta estimates of the TPP effect on turnover is represented by percentage point differences.

Results

Our baseline results of the differential effects of preparation pathway on student achievement are displayed in Figure 1. Coefficients refer to differences in achievement compared to traditionally prepared teachers in university-based programs. Magnitudes are presented as effect sizes, and the confidence intervals are represented by the brackets. In both reading and math, our analysis indicated that two preparation pathways were linked to declines in student achievement: teachers prepared via fully online programs in reading (-0.04σ) and math (-0.04σ) and uncertified teachers in reading (-0.05σ). Additionally, we found that students of teachers prepared in other postbaccalaureate programs tended to exhibit better achievement in reading (0.02σ) and math (0.03σ).

Table 2 displayed estimates that bifurcate each pathway into groups of teachers who opted for the standard clinical experience and teachers who opted for the paid internship experience. Recall the teachers prepared in programs that offer fully online certification pathway but who opt for the clinical experience are now taken out of the other postbaccalaureate category and placed into the online, clinical experience category. Findings shown in Table 2 suggest that students with teachers prepared in these programs but have a clinical experience do not experience the same declines in achievement as students taught by teachers prepared in these programs but opt for the paid internship. Recategorizing the preparation pathways change estimated effects across pathways slightly, but the fully online category remains one of the few preparation pathways yielding statistically significant, negative effects on student achievement. Consistent with findings shown in

Figure 1, estimates from Table 2 indicate the declines observed for online teachers are quite similar to those for uncertified teachers.

Figure 2 displays differences in the likelihood of turnover by preparation pathway, accounting for the suite of covariates as well as grade-level and school-specific time trends. We found evidence that turnover varies significantly across pathways. Compared to traditional university programs, teachers prepared fully online are 5 percentage-points more likely to turnover. Out-of-state teachers are 6 percentage-points more likely to turnover. Uncertified teachers are 12 percentage-points more likely to turnover. Intuitively, this makes sense given these teachers are often late hires to fill classrooms where districts have no other option but to employ a teacher with no certification or permit record (Franco & Patrick, 2023). Teachers prepared via University Alternative, LEA/ESC, and Other Postbaccalaureate programs are no more or less likely to turnover compared to traditionally prepared teachers.

Sensitivity Tests

We employed several different model specifications with different samples of students to examine the extent to which our results may be conflated with other non-TPP factors. These tests included removing the 2022-23 years of testing to avoid conflating possible effects from COVID-19 school closures. We adjusted our sample to only include teachers who remained in teacher for the full three years following exit from their TPP. We removed charter school students from our sample. Lastly, we removed uncertified teachers from our sample. Across these models, the estimates for TPP pathway effect were either the same or larger than those from our baseline specification. Overall, the consistency of our estimates across these different models adds confidence to our findings of differential effects by TPP pathways on student achievement and teacher turnover.

Discussion

Our study provides contemporary insights into the differential effects of teacher preparation on student achievement and teacher turnover in Texas. Our findings underscore the critical importance of the pathway chosen by aspiring educators in shaping both academic outcomes for students and the stability of the teaching workforce.

The results of our analysis reveal significant variations in student achievement across different TPPs. Notably, teachers prepared through fully online programs and uncertified teachers exhibit declines in student achievement in both reading and math compared to traditionally prepared teachers in university-based programs. These findings suggest that while online programs offer convenience and flexibility, they may not adequately equip teachers with the necessary skills and competencies to effectively support student learning. Conversely, students taught by teachers from other postbaccalaureate programs tend to demonstrate better achievement outcomes, highlighting the potential effectiveness of some alternative pathways in preparing educators for the classroom. Our analysis further examines the differential effects of the clinical and internship experiences within fully online programs. We find that students with teachers who opt for the clinical experience do not experience the same declines in achievement as those taught by teachers who choose the paid internship. This suggests that the nature of the practical training experience within programs that offer several online components may play a crucial role in mitigating the negative effects on student achievement observed in the fully online pathway.

Teacher turnover rates vary significantly across TPPs, with fully online, out-of-state, and uncertified teachers exhibiting higher likelihoods of leaving the profession compared to traditionally prepared teachers. Higher turnover among out-of-state teachers is consistent with prior research (Redding & Henry, 2018). Intuitively, this makes sense that uncertified teachers are more likely to turnover given they are often late hires to fill classrooms where districts have no other option but to employ a teacher with no certification or permit record (Franco & Patrick, 2023). However, the

finding that teachers prepared fully online is a new contribution to the literature and an important finding given nationwide teachers shortages. Arguably, this finding is relevant to targeted strategies aimed at improving support and resources for teachers should focus on teachers seeking in-state certification in programs that advertise themselves as high-quality and as major suppliers of teachers to the state.

Policy Implications

Balancing Oversight and Accessibility. As Texas and the nation grapples with teacher shortages exacerbated by the pandemic and a surge in uncertified educators, there's a delicate balance to strike between ensuring quality and maintaining accessibility to the teaching profession. While more oversight and in-field experiences could enhance the preparation of educators, we acknowledge the challenges of imposing additional regulations in an already strained system. Policymakers may benefit from exploring innovative solutions that promote quality assurance without creating barriers to entry for aspiring teachers.

One such option includes an investment in teacher residency programs, which offer aspiring educators invaluable opportunities for immersive, hands-on training in real classroom settings. In Texas, many residency programs provide teacher candidates with a stipend during their student teaching experience, which mitigates the impact of having no employment for a significant period. Policymakers could explore investments in the expansion and enhancement of residency pathways. Research has shown that residency programs are underscored by high-quality mentorship and support (Darling-Hammond et al., 2016; Jessen et al., 2020; Olson, n.d.), which is intended to bridge the gap between theory and practice and prepare educators for the complexities of the modern classroom.

With the expansion of high-quality preparation options, policymakers should also prioritize the enhancement of oversight and regulation for online TPPs. Anecdotes from stakeholders

concerned about these programs range from a lack of support during teachers' internship period to even finding a hiring school district. In the significantly deregulated teacher preparation landscape of Texas, some TPPs programs have been shut down or scrutinized for reasons ranging from failing accountability metrics (Donaldson et al., 2022) to having improper business addresses (e.g., a pipe factory; Texas Education Agency, 2013). Basic oversight that includes enforcing more accurate data reporting on student achievement outcomes and teacher satisfaction of candidates (c.f., Texas Education Agency, 2019). The Texas Education Agency serves as state-specific example of increasing data availability that links TPP graduates to in-service experiences as well as enforcing requirements for passage rates of candidates for TPPs (Texas Education Agency, n.d.). As the state grapples with ongoing teacher shortages, policymakers must prioritize measures to strengthen accountability and ensure that all educator preparation programs adhere to rigorous standards of quality and effectiveness.

Emphasis on In-Service Experience. There is no doubt our results show the benefit of having teachers complete clinical experiences prior to leading their own classroom full-time. While policymakers balance incentivizing clinical experiences, teacher educators should emphasize the importance of in-field experiences to their candidates, as previous research underscores that hands-on learning opportunities bridge the gap between theory and practice. Emphasizing the value of immersive learning experiences, such as student teaching and clinical placements, can equip aspiring educators with the practical skills and insights needed to succeed in the classroom. By promoting experiential learning, we can ensure that all educators enter the profession feeling confident and well-prepared to meet the needs of their students.

Collaborative Efforts for Sustainable Solutions. Addressing concerns about uncertified teachers requires a collaborative approach that engages stakeholders across the full arc of the teacher pipeline from pre-service to in-service. School districts often face little choice but to hire uncertified

educators to fill empty classrooms. This problem cannot be addressed without the implementation of options that increase the supply of high-quality teachers. While there are no direct implications from our study on solutions for the rising number of uncertified teachers, we encourage policymakers and stakeholders to begin laying the groundwork to phase out this population of teachers. This may include limiting opportunities for these teachers to receive the same benefits as licensed teachers (e.g., eliminating merit-pay for uncertified teachers via the Texas Teacher Incentive Allotment). It may include dissemination of knowledge about the drawbacks of having uncertified teachers with regard student outcomes and turnover.

Variation within TPP Pathways. Our findings suggest the need for a nuanced understanding of teacher preparation pathways (TPP) and their effectiveness. Just as some pathways may yield better outcomes for certain candidates, it is plausible that the effectiveness of TPPs varies among different cohorts of aspiring educators. This underscores the importance of investigating the heterogeneity within TPP pathways. Researchers, policymakers, and stakeholders should delve into factors such as candidate demographics, prior experiences, and pedagogical preferences to identify which pathways are most beneficial for specific groups of individuals. For example, it may be the case that a paraprofessional who has worked in a district for several years- and thus has stronger ties to the district's students and the local community- may be more successful completing a fully online program compared to a candidate coming from a different career or industry. By exploring these nuances, we can develop tailored approaches to teacher preparation that better meet the diverse needs of aspiring educators, ultimately enhancing teacher effectiveness and improving student outcomes.

Limitations and Future Research

While our study provides valuable insights into the differential effects of various teacher preparation pathways on student achievement and teacher turnover, it is important to acknowledge

several limitations. Firstly, our analysis relies on observational data, which means we do not observe teaching practices or mentorship that candidates receive. We encourage future researchers to explore phenomenon underpinning online teacher preparation, particularly given the sheer number of students who are being taught by an online teacher. Additionally, the study focuses on Texas-specific data, which may limit the generalizability of our findings to other contexts with different teacher preparation landscapes and student populations. Although it is important to note that other states began a similar expansion of teacher preparation options to online programs (e.g., Virginia Department of Education, n.d.). Lastly, our analysis does not account for potential variations in the quality of TPPs within each pathway. It is certainly the case that some select programs within each category may be effective compared to the average effects presented here. Similarly, it may also be the case that some preparation pathways are more effective for some candidates and not others. We urge researchers to examine the heterogeneity within these TPP pathways.

Conclusion

The proliferation of alternative certification programs, particularly online options, raises concerns about educator retention and student outcomes. Our research findings suggest that teachers prepared through alternative pathways, especially for-profit online programs, may be more likely to leave the profession or face challenges in meeting the diverse needs of students. As Texas confronts persistent staffing gaps and strives to improve educational equity, policymakers must consider the long-term implications of alternative certification pathways on teacher retention and student success. In summary, our research underscores the importance of maintaining a delicate balance between oversight and accessibility in the educator preparation landscape. By prioritizing supportive measures, promoting experiential learning, and fostering collaborative efforts, Texas can address challenges tied to teacher vacancies while ensuring that all educators receive the preparation and support they need to succeed in the classroom.

Table 1. Descriptive statistics of new teachers by preparation pathway

Pathway	<u>Online</u>	<u>University Traditional</u>	<u>University Alternative</u>	<u>LEA or ESC</u>	<u>Other Postbac</u>	<u>Out of State</u>	<u>Uncertified</u>
<i>Teacher characteristics</i>							
Paid internship	0.94	0.00	0.54	0.87	0.89	0.82	0.00
Male	0.21	0.10	0.15	0.21	0.24	0.11	0.24
Asian	0.02	0.02	0.04	0.04	0.04	0.03	0.03
Black	0.23	0.07	0.11	0.17	0.31	0.14	0.28
Latinx	0.22	0.27	0.22	0.24	0.22	0.10	0.31
Other race/ethnicity	0.03	0.04	0.03	0.06	0.04	0.03	0.04
Advanced degree	0.15	0.08	0.35	0.15	0.18	0.35	0.15
Out of content or grade level	0.25	0.35	0.31	0.35	0.27	0.31	0.00
Years of experience	2.85	3.00	3.00	3.02	3.04	2.72	0.81
Log salary	10.83	10.82	10.80	10.82	10.86	10.86	10.73
<i>Student and school characteristics</i>							
Class size	20.86	20.98	20.89	21.44	21.85	21.20	25.86

Male	0.51	0.51	0.51	0.51	0.51	0.51	0.50
Asian	0.03	0.05	0.04	0.03	0.04	0.06	0.03
Black	0.16	0.12	0.13	0.14	0.20	0.15	0.17
Latinx	0.53	0.51	0.52	0.58	0.55	0.44	0.61
Other race/ethnicity	0.05	0.05	0.05	0.04	0.04	0.06	0.04
Economically disadvantaged	0.68	0.61	0.64	0.69	0.71	0.55	0.73
Individualized education program	0.10	0.09	0.09	0.09	0.09	0.10	0.08
English learner: Current	0.23	0.20	0.21	0.27	0.29	0.18	0.29
English learner: Reclassified	0.11	0.09	0.09	0.11	0.11	0.09	0.10
Reading achievement: Previous year	-0.07	0.01	-0.01	-0.06	-0.07	0.05	-0.08
Math achievement: Previous year	-0.05	0.03	0.01	-0.03	-0.04	0.07	-0.08
Major urban	0.17	0.16	0.21	0.24	0.27	0.18	0.06
Major suburban	0.15	0.17	0.19	0.13	0.10	0.15	0.06
Other central city	0.35	0.37	0.24	0.30	0.36	0.41	0.08
Other central city suburban	0.12	0.13	0.13	0.09	0.09	0.11	0.05
Independent town	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Non-metropolitan: Fast growing	0.05	0.05	0.05	0.04	0.01	0.03	0.05

ONLINE TEACHER PREPARATION

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Non-metropolitan: Stable	0.05	0.05	0.06	0.04	0.01	0.03	0.05
Rural	0.02	0.02	0.03	0.02	0.01	0.01	0.03
Charter	0.07	0.05	0.08	0.13	0.13	0.06	0.62
Percentage of observations	0.27	0.36	0.05	0.09	0.04	0.13	0.06

Figure 1

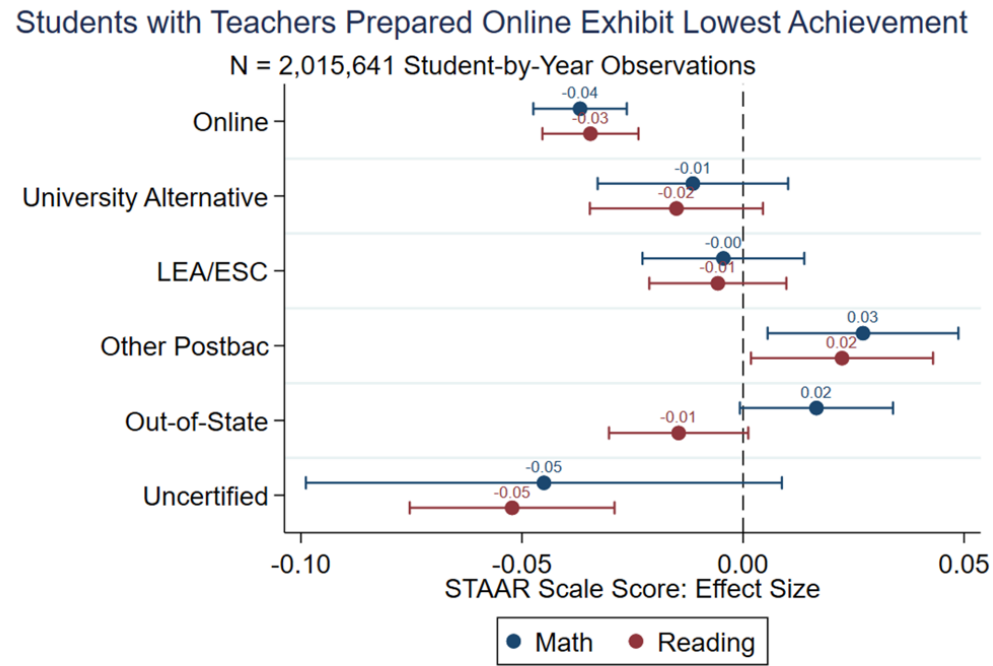


Table 2. Estimates of teacher preparation pathway effect on achievement: Internship vs. Clinical Experience

Outcome	Math	Reading
<i>Paid-internship</i>		
Online	-0.06*** (0.02)	-0.05** (0.01)
University alternative	0.01 (0.03)	-0.02 (0.04)
Local education agency or regional service center	-0.02 (0.02)	-0.03 (0.04)
Other postbaccalaureate	0.03* (0.02)	0.02* (0.01)

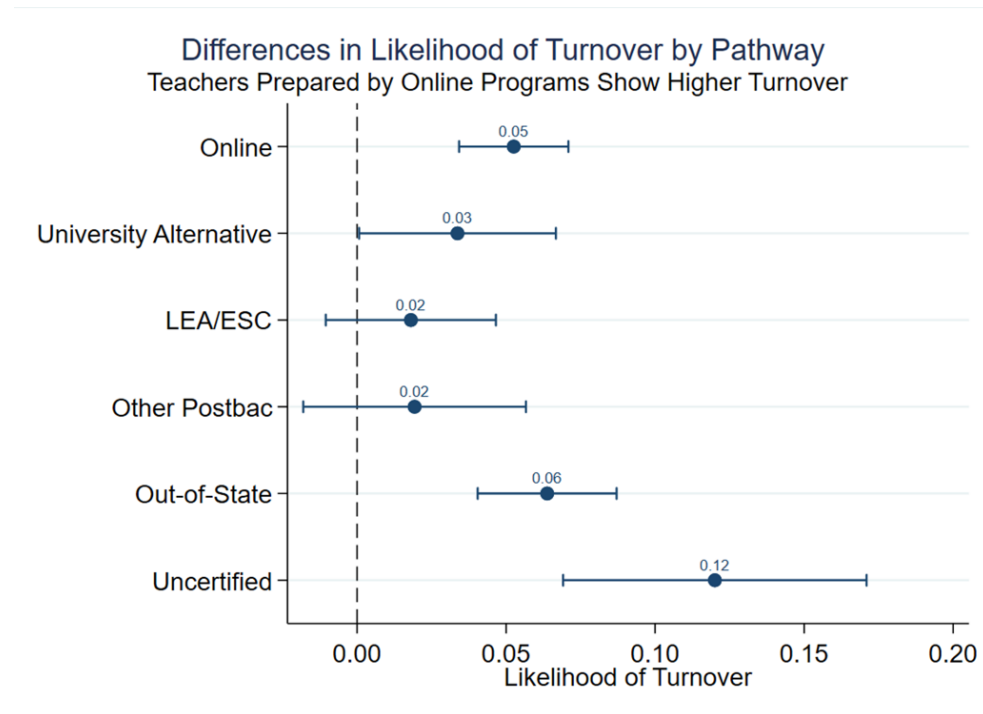
Out-of-state	-0.02*	-0.03
	(0.01)	(0.03)
<i>Clinical</i>		
Online	-0.04	-0.01
	(0.08)	(0.02)
University alternative	-0.04	-0.02
	(0.04)	(0.01)
Local education agency or regional service center	-0.04	0.07
	(0.01)	(0.05)
Other postbaccalaureate	0.05**	0.03*
	(0.02)	(0.01)
Out-of-state	0.01	0.03
	(0.01)	(0.02)
Uncertified	-0.05	-0.05*
	(0.07)	(0.02)
<i>Covariates</i>		

Teacher	Yes	Yes
Student	Yes	Yes
Classmates	Yes	Yes
School	Yes	Yes
<i>Fixed effects</i>		
Grade	Yes	Yes
School-by-Year	Yes	Yes
Observations	2,015,641	2,015,641

Note. Standard errors in parentheses.

*p < .05. **p < .01. ***p < .001.

Figure 2



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Appendix

Criteria for Classifying Preparation Pathways

Online. A teacher preparation pathway where candidates complete all coursework online without student teaching. Candidates opting for the internship option within this pathway engage in a minimum of 30 hours of classroom observation, with 15 hours conducted asynchronously and virtually.

University Alternative. Alternative certification programs housed at universities. Candidates in this pathway typically complete coursework and field experiences under the guidance of university faculty.

Local Education Agency or Education Service Center. Teachers prepared through their local school district or education service center. This pathway typically involves a combination of coursework and practical experience within the district or center.

Other Postbaccalaureate. All other alternative pathways in Texas that do not fall under the aforementioned categories. This includes non-university residency programs, nonprofit programs, for-profit programs that are not fully online, community college programs, among others. Candidates in this pathway pursue alternative routes to teacher certification that may involve various combinations of coursework and practical experiences.

Out-of-State. Teachers prepared through teacher preparation programs located outside of Texas. These programs may vary in structure and requirements.

Uncertified. This pathway refers to individuals who do not possess a teaching certificate or have not completed a state-approved teacher preparation program. These individuals do not have any certification record from the State Board for Educator Certification data.